

# Inter-hemispheric differences in cirrus microphysical and optical properties as a function of the relative humidity

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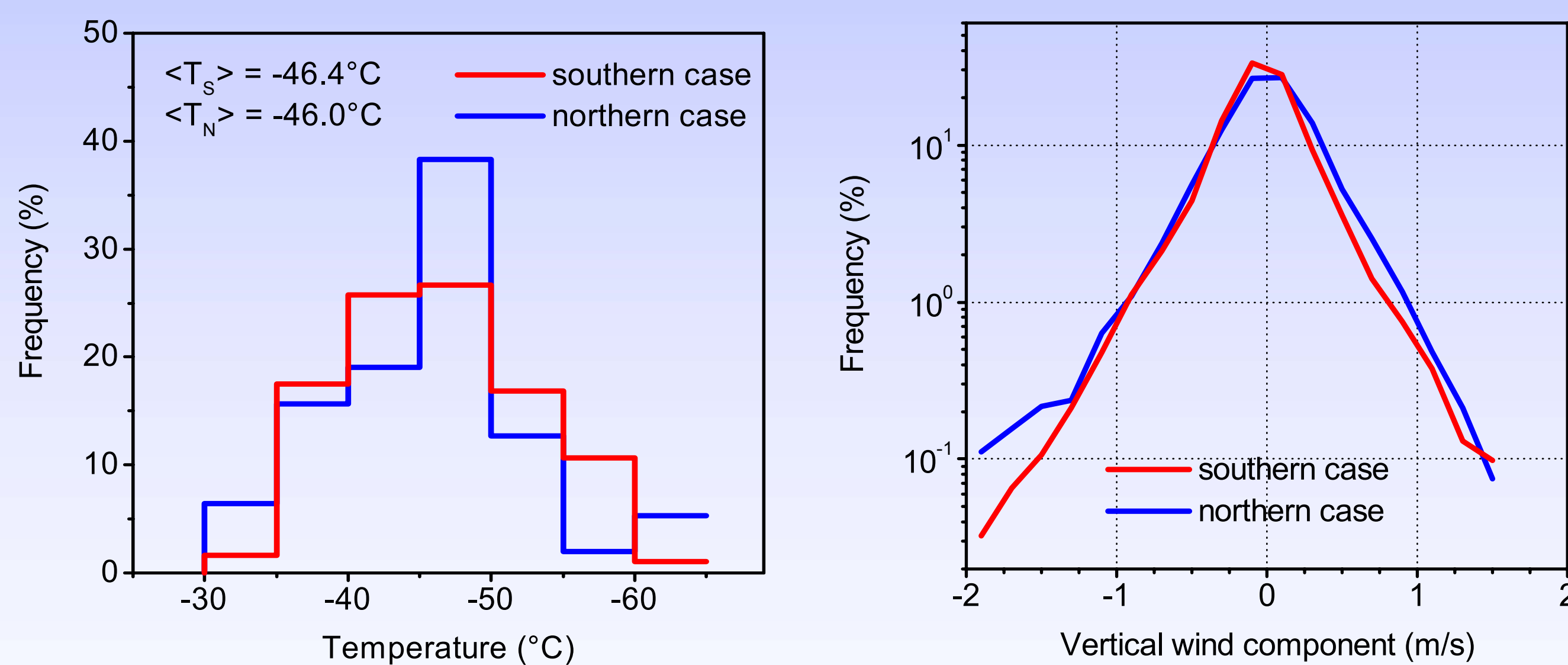
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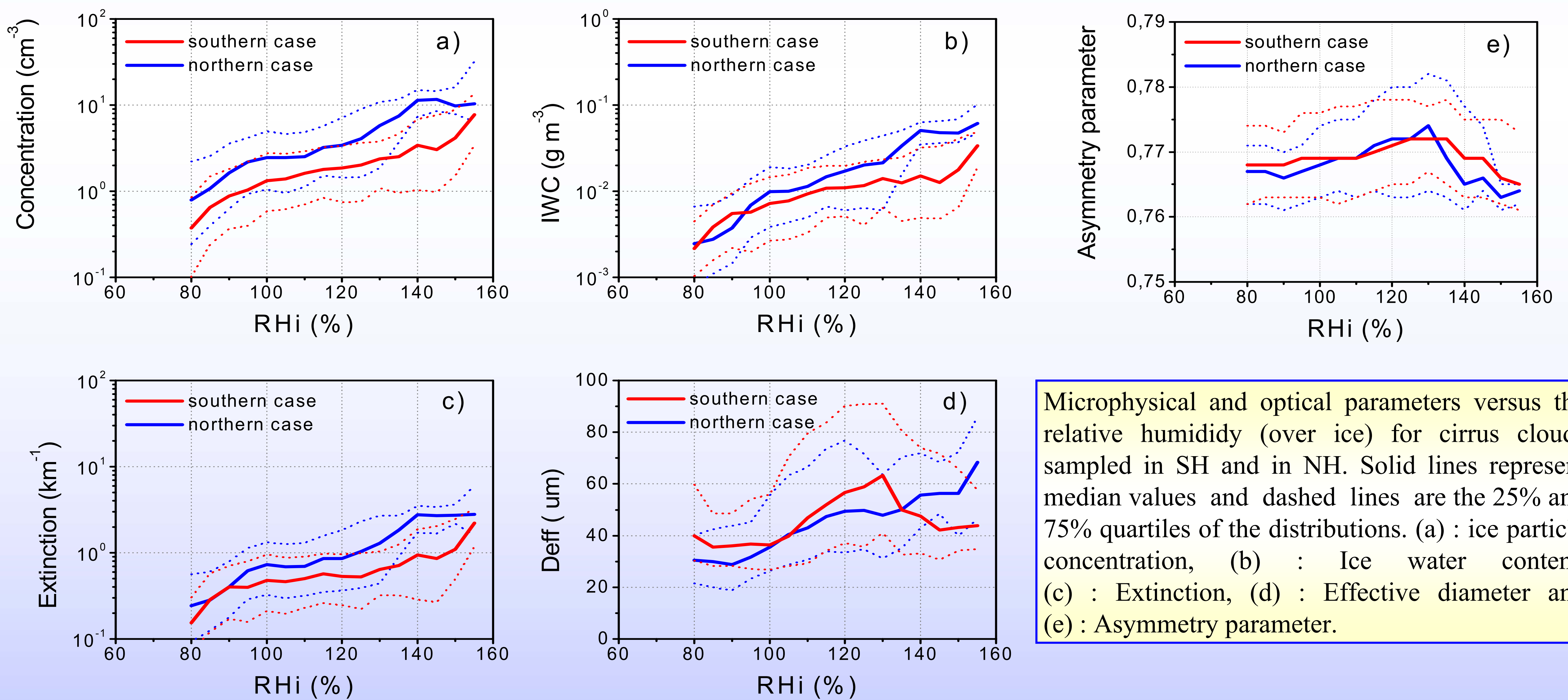
Microphysical and optical measurements have been performed in mid-latitude cirrus clouds at temperature ranged between -33°C to -60°C with aerosol properties and gas traces during two campaigns in the southern (SH) and northern (NH) hemispheres within the european INCA project. The same instrumentation has been operated onboard the German DLR Falcon in a same local season (Autumn). The aim of the poster is to present the interhemispheric differences in cirrus properties between the two campaigns with emphasis on the relationships with the relative humidity.



Parameter	SH	NH	$\Delta$ (NH-SH)
Ice Conc. (cm <sup>-3</sup> )	1.45	2.23	42%
IWC (mg/m <sup>3</sup> )	8.1	8.0	1%
Extinction (km <sup>-1</sup> )	0.49	0.61	22%
Deff (μm)	42.1	36.2	-15%
Asymmetry	0.770	0.767	-4%

Frequency distributions of the in-cloud temperature ( $T$ ) and the vertical wind component ( $w$ ) during the SH and SH field experiments.

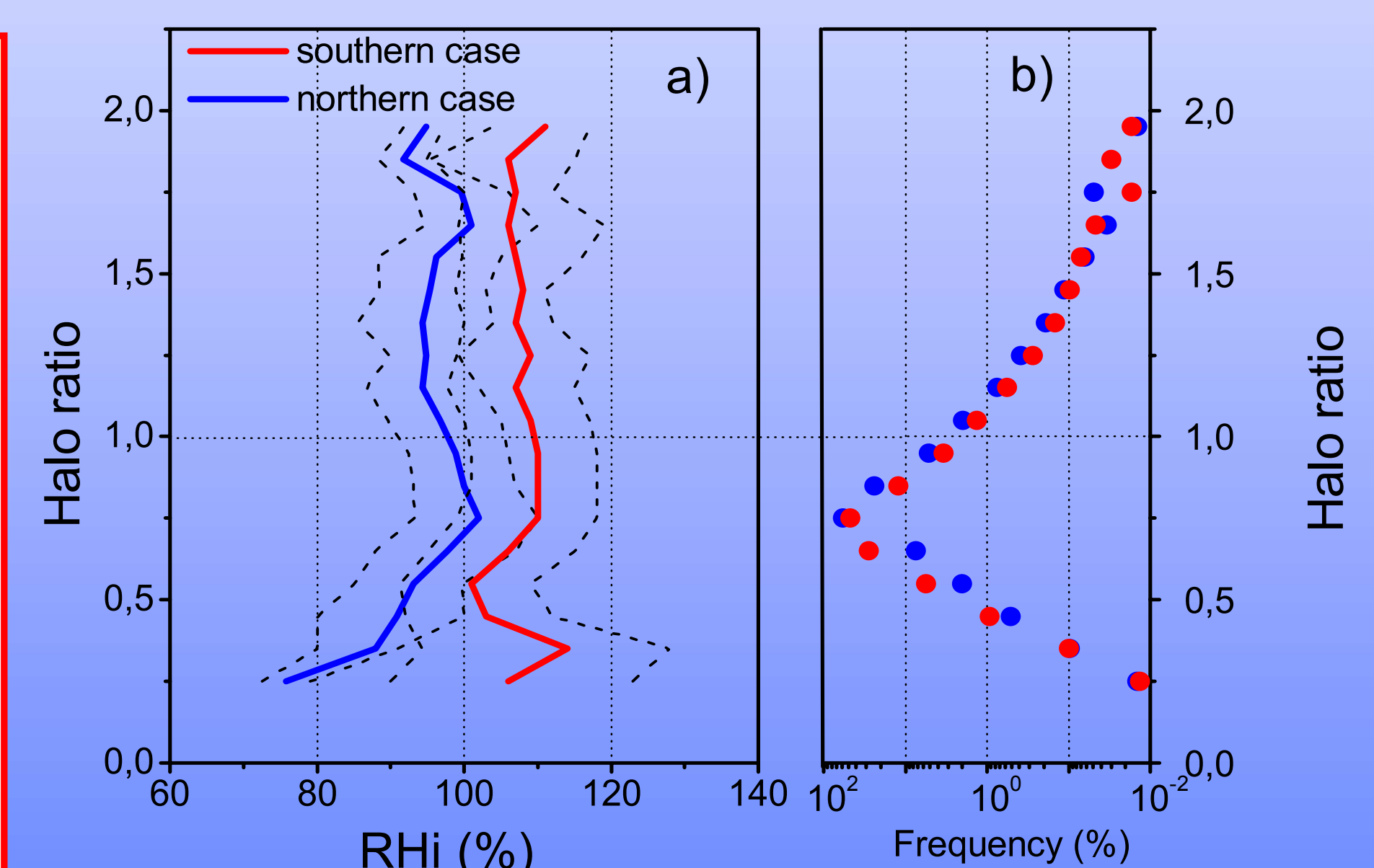
SH and NH campaign median values and relative differences of the ice particle concentration, ice water content, extinction, effective diameter and asymmetry parameter (all data).



Microphysical and optical parameters versus the relative humidity (over ice) for cirrus clouds sampled in SH and in NH. Solid lines represent median values and dashed lines are the 25% and 75% quartiles of the distributions. (a) : ice particle concentration, (b) : Ice water content, (c) : Extinction, (d) : Effective diameter and (e) : Asymmetry parameter.

## CONCLUSIONS

- ✓ A difference of 10-20% RH<sub>i</sub> is observed between SH and NH data sets whatever the considered microphysical and optical parameters.
- ✓ These contrasts can be related to cirrus freezing threshold differences with onset of clouds in NH at about 20% lower RH<sub>i</sub> than in SH (Hagg *et al.*, 2003).
- ✓ IWC is controlled not by the aerosol freezing properties but rather by the advection of water (condensable) vapor, i.e. higher number of ice particles with smaller diameter may be related to a lower freezing threshold (Kärcher and Lohmann, 2002).
- ✓ Only 3% of cirrus clouds exhibit 22° halo occurrence related to pristine ice crystals in both SH and NH data sets.
- ✓ Rather uniform cirrus particle scattering properties are observed in both hemispheres ( $g = 0.770 \pm 4\%$ ) with no significant differences in crystal shape.



(a) : 22° Halo ratio versus the relative humidity for SH and NH data. (b) : Frequency distributions of the 22° halo ratio data points for SH and NH.

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